

Coastal Habitats in Puget Sound

Science in Support of Nearshore Ecosystem Restoration

Concern for the health of Puget Sound nearshore habitats has escalated with the recent Endangered Species Act listing of salmon. Nearshore habitats provide, food, shelter, migratory corridors and even spawning areas for salmon, crab, forage fishes, and other important species. To develop effective salmon and nearshore ecosystem recovery programs, local and state governments seek a better understanding of what promotes and sustains a healthy, functioning shoreline. The US Geological Survey can provide objective science, technology development, and information transfer in support of adaptive management strategies for the conservation, protection, and restoration of the region's unique coastal resources.



Over 2000 miles of geologically diverse and ecologically productive shoreline encircle Puget Sound, which is dominated by eroding bluffs, unstable glacial sediment, large river deltas, low-lying beaches, and small streams. Natural events, such as landslides, flooding, and earthquakes, can play an important role in creating coastal habitat. Today, these same natural events pose a significant risk as population pressures increase in the region.

These pressures have resulted in human-induced changes along the coast that are widespread and include alterations of nearshore processes such as changes in hydrology, armoring of eroding bluffs, dredging, sediment disposal, and intertidal fills.

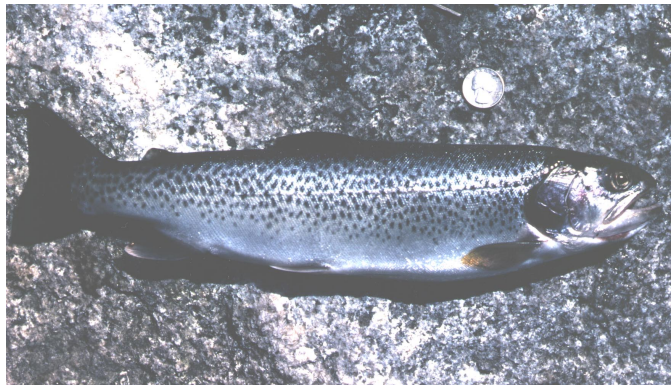
Managers question whether these modifications are responsible for:

- Declining populations of fish and wildlife
- Loss and degradation of seagrass and other coastal habitat
- Changes in water quality and availability

Biological activity is concentrated in the shallow nearshore waters and coastal streams of Puget Sound.

The viability of these nearshore habitats is directly linked to coastal geologic and hydrologic processes.

Understanding the natural processes and human-induced changes with respect to ecological function is critical to managing both the hazards and the valuable environmental resources found along the coast of Puget Sound.



Coastal cutthroat populations in Puget Sound have declined. To restore populations managers require basic information on the human influences on these species and their habitats. Unfortunately, less is known about this anadromous salmonid than any other salmon species in the Pacific Northwest. Biologists use the ear bone or otolith (right) for aging fish by reading the rings. Otolith growth patterns can also be used to determine how long juvenile salmon spend in fresh water versus estuarine habitats.



Unfortunately, knowledge regarding how biological and geological processes affect ecosystem health in the coastal zone of Puget Sound is largely nonexistent.

To fill this knowledge gap, the USGS will enhance science activity in the region. The science will be coordinated with partners at the University of Washington, the Army Corps of Engineers and with local, state, and federal resource managers.

The goal is to develop coastal ecosystem understanding through interdisciplinary studies examining the links among terrestrial, nearshore, and marine environments.

Key Science Needs

- Assess the effects of population growth in geologically hazardous or biologically sensitive areas.
- Characterize, measure, and monitor the interactions among geologic, hydrologic, and biologic processes.
- Understand the geologic and hydrologic controls on the habitat of endangered and threatened fish and wildlife.
- Understand watershed linkages with estuarine, coastal and marine environments.
- Evaluate the impacts of increased demand for water on groundwater and surface-water systems, hillslope stability, ecological habitat, and biota.
- Monitor and predict the fate of contaminants and invasive species that may influence the health of ecosystems and, potentially, humans.
- Investigate the role of shoreline armoring in modifying the integrity of shoreline habitats.
- Understand the role of coastal landslides and shoreline erosion on biological habitat.
- Develop Decision Support Technologies to assist natural resource management and policy making.



Massive landslide at Woodway along the bluffs of Puget Sound. This natural event damaged the railroad tracks, and supplied large amounts of sediment to the nearshore environment. The effect of natural events like this one, as well as human-induced changes along the coast on the nearshore ecosystem are unknown.

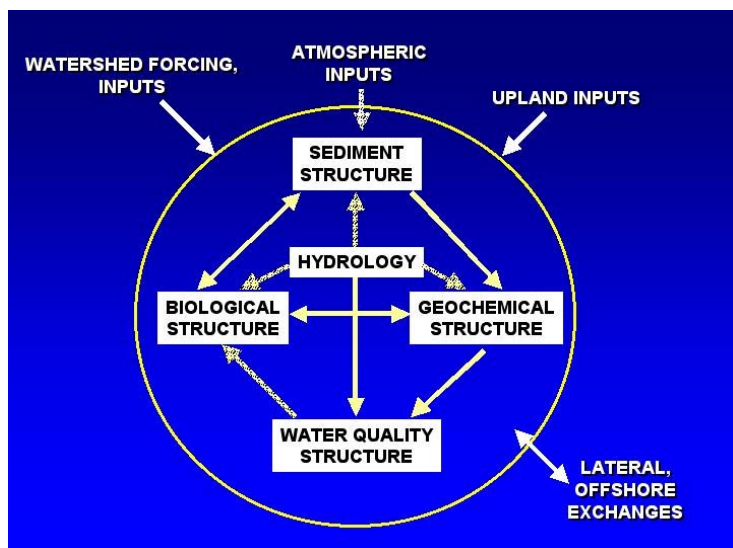
Agencies charged with oversight of coastal resources suffer from lack of specific data and information to support management planning. The USGS science capability in coastal environments can fulfill these needs for a complex array of physical and biological data and information to effectively manage urban growth and development, as well as support specific restoration efforts.

Major Products

Mapping coastal features: provide USGS partners with detailed digital maps of geology, hydrology, and land-use change.

Modeling and predicting bio-geo-hydro interactions: provide USGS partners with tools and models to understand and predict the geological and hydrological factors that control habitat and ecosystem health.

Information management: serve data and information to inform all aspects of ecosystem restoration; reveal trends through monitoring to guide adaptive ecosystem management.



Puget Sound nearshore ecosystem health is controlled by various complex interactions between the geology, hydrology, chemistry, and biology. Some of these interactions are modified by natural events and some by human-induced changes.



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